Aquatic insect responses to stream restoration. How do we define success?

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Introduction

Stream channel reconfiguration or restoration is widely used as a mitigation tool for stream loss by many regulatory agencies. However in a recent review of over 38,000 stream restoration projects nationwide, only 14-20 % of these projects had any post-construction monitoring information (National River Restoration Science Synthesis or NRRSS). Benthic macroinvertebrate samples were collected from 13 stream restoration projects prior to construction and, allowing one year for the stream to stabilize, sampled again during consecutive annual surveys following construction. All collection methods mimic those defined by the North Carolina Division of Water Quality. These data were collected attempting to determine "success" criteria for stream restoration in North Carolina.

Figure 1. Stream prior to and during restoration

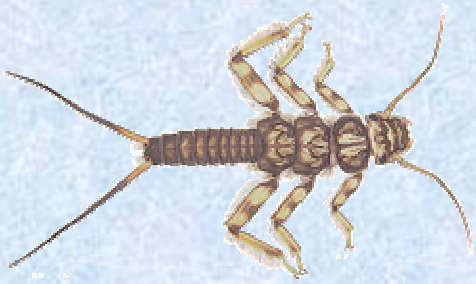

Figure 2. Same stream two years following restoration.

Background

EPA initially funded the NC Division of Water Quality to conduct surveys of stream restoration projects. Initial surveys were conducted in 2002 and preliminary "success criteria" were developed as part of this granting process.

The data submitted to EPA was considered very preliminary and one of recommendations to EPA was to continue long-term monitoring of these projects. North Carolina State University was awarded a grant from the NC Ecosystem Enhancement Program to continue this monitoring.

Biological success criteria initially proposed in the EPA grant are being tested as long-term data are collected. These criteria are listed below (and compared in the overview table).

- ❑ 75% Dominant taxa in Common (DIC) with upstream reference conditions.
- ❑ 50% DIC if ecoregional data are used (upstream reference data not appropriate).
- ❑ Reestablishment of "Keystone" or indicator taxa. This particular criteria will need further testing.

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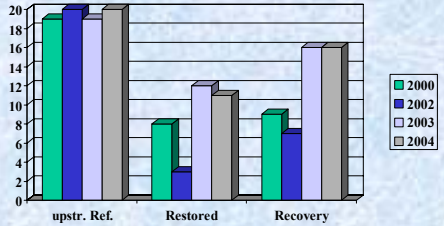
Results

Overview observations and summaries following construction of new stream channels.

Project Name	# post constr. surveys	Year 1		Year 2		Year 3		Year 4		Met Proposed Criteria?
		Improved ab background	Improving over previous year	Improved ab background	Improving over previous year	Improved ab background	Improving over previous year	Improved ab background	Improving over previous year	
High Vista	2	N	-	N	N					No
Little Pine	1	N	-							No
Payne Dairy *	3	N	-	Y	Y	Y	N			No
Price Park	2	N		N	Y					No
Lyle Creek	2	N	-	N	Y					No
Hominy Swamp	1	Y	-							No
Smith/Austin (s)	2	Y	-	Y	N					No
Smith/Austin (a)	2	Y	-	Y	N					No
Murphy Farm	2	Y	-	Y	N					No
Beaver Creek	1	N	-							No
Brown Branch	1	Y	-							No
Stone Mt.	4	N	-	N	Y	Y	Y	Y	N?	No
Rocky Branch	2	Y	-	Y	Y					No

* Payne Dairy, EPT Taxa Richness



What have we learned?

- ❑ Nearly ½ of the projects we looked at did not improve when compared to background conditions one and two years after construction.
- ❑ Data from only ½ of these projects suggested that community structure continue to improved two and three years after construction compared to the previous investigation.
- ❑ Proposed "success" criteria have not been met at any projects even after 4 years of post-construction monitoring.
- ❑ More experimental projects are needed. Need to look at the improvements in downstream water quality (i.e. Payne Dairy Project).
- ❑ Much more work needs to be done with indicator (or keystone) taxa and their specific habitat requirements before they can be used as success criteria.